Neuroscience-based Nomenclature (NbN) for *Journal of Psychopharmacology*

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As of May 2016, the *Journal of Psychopharmacology* will fully adopt Neuroscience-based Nomenclature (NbN) for all publications and correspondence. In this, we join many other leading journals in our field, including *European Neuropsychopharmacology*, *Biological Psychiatry*, *CNS Spectrums*, *European Psychiatry*, *International Journal of Neuropsychopharmacology*, *Journal of Clinical Psychopharmacology*, *Neuropsychopharmacology*, *Pharmacopsychiatry*, *World Journal of Biological Psychiatry* and others that will also recommend the use of NbN. This decision has been ratified by the British Association for Psychopharmacology (BAP) council.

For the *Journal of Psychopharmacology* and the BAP, this step marks the output of a process that we have been involved in developing with the European College of Neuropsychopharmacology (ECNP). Part of the impetus to this initiative came from an editorial in *Journal of Psychopharmacology* back in 2009 (Nutt, 2009). Most of the vital background data collecting and organisation of the knowledge base has been done by a BAP member, Dr Sue Wilson.

Under the leadership of the ECNP in 2008, a taskforce for psychotropic nomenclature composed of representatives from five international organisations: the ECNP, American College of Neuropsychopharmacology, Asian College of Neuropsychopharmacology, International College of Neuropsychopharmacology and International Union of Basic and Clinical Pharmacology. The group tasked itself 'to examine ways of improving the current nomenclature in psychopharmacology'. Specifically, the new nomenclature was to (a) be based on contemporary scientific knowledge, (b) help clinicians to make informed choices when working out the next 'pharmacological step', (c) provide a system that does not conflict with the use of medications and (d) be future proof to accommodate new types of compounds. An initial proposal (Zohar et al., 2014) was discussed in the scientific community and accordingly revised (Zohar et al., 2015). It is this revised system that *Journal of Psychopharmacology* will use.

NbN is a pharmacologically driven system. In this, it is scientifically precise and extensible: new drug targets or modes of action can be easily added to the system once accepted by the scientific community. It is fairly comprehensive: at the present time, it includes 108 compounds which span the great majority of what is currently used in the practice of psychopharmacology. However, this very precision requires of authors and readers to adjust some well-worn habits: for example, use of the terms 'second-generation' or 'atypical antipsychotic', or even more so a group reference such as 'anxiolytics' referring to a group of substances with quite heterogeneous receptor targets and mode of action. From an editor's point of view, we realize that this will pose some additional challenges for our authors, but we believe that readers and ultimately the field will benefit greatly – first, by the self-imposed terminology precision itself, and second, by sometimes making it clear where gaps in our knowledge still exist, especially when the modes of action of drugs with relationship to our evolving understanding of the neurobiology of mental illness are concerned (Millan et al., 2015).

Using NbN will require authors to clarify their meaning when they use a term for a drug. To ease the transition, *Journal of Psychopharmacology* will adopt NbN in stages: the first, effective as of May 2016, requires authors to define their usage, in the paper, of a term such as 'antipsychotics' using NbN at the point that it first appears in the main text of the paper. Furthermore, to make all new papers searchable by NbN, the NbN nomenclature of the substances that the paper covers has to be added to the keywords of the paper. To this end, we are dropping our previous limitation (of five) for keywords and have added a specific subcategory NbN to the keyword finder.

The new keywords include 11 pharmacological domains and 10 modes of action which are the building stones of NbN. It will make this process easier for authors and readers searching for one of our publications.

How does NbN work in practice? To 'translate' between old and new nomenclature, the easiest and recommended way is to use the approved app, which is available on the project's website (http://nbnomenclature.org/), as well as in the software repositories of the various platforms for which it is available. On this website, there is a special tag – For Authors. A link to these resources is also now included in our Instructions For Authors.

The NbN effort is still in its infancy. Some necessary steps, such as the inclusion of paediatric psychopharmacology and neuropharmacology in domains such as epilepsy are already being

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worked on and will be included in the nomenclature in the near future. Most importantly, we believe that a clearer understanding of pharmacology will greatly benefit translational neuroscience and the discovery of new treatments for brain disorders.

References

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Table 1. Neuroscience-based Nomenclature – NbN Glossary[a].

Former terminology	**NbN – Pharmacological based**		Drugs
Indication based	Pharmacology	Mode of action[b]	
Antidepressant	Drugs for depression		
(TCA)	norepinephrine	reuptake inhibitor (NET)	desipramine
	norepinephrine, serotonin	reuptake inhibitor (NET and SERT)	protriptyline,lofepramine, amoxapine, nortriptyline
	serotonin, norepinephrine	reuptake inhibitor (SERT and NET)	imipramine, dosulepin
	serotonin	reuptake inhibitor (SERT)	clomipramine
	serotonin, norepinephrine	MM; reuptake inhibitor (SERT and NET), receptor antagonist (5-HT2)	amitriptyline
	norepinephrine, serotonin	MM; reuptake inhibitor (NET and SERT), receptor antagonist (5-HT2)	Doxepin
	serotonin, dopamine	receptor antagonist (5-HT2 and D2)	trimipramine
(MAOI)	serotonin, norepinephrine, dopamine	enzyme inhibitor (MAO-A and -B)	isocarboxazid, phenelzine
		reversible enzyme inhibitor (MAO-A)	moclobemide
		MM; enzyme inhibitor (MAO-A and -B), releaser (DAT, NET)	tranylcypromine
	dopamine, norepinephrine, serotonin	enzyme inhibitor (MAO-B and -A)	selegiline
(SSRI)	serotonin	reuptake inhibitor (SERT)	citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine, sertraline
(SNRI)	serotonin, norepinephrine	reuptake inhibitor (SERT and NET)	venlafaxine, duloxetine
	norepinephrine, serotonin	reuptake inhibitor (NET and SERT)	milnacipran
Stimulants			
	Dopamine and norepinephrine	Reuptake inhibitors and release	amphetamine (D) and (D,L), lisdexamfetamine, methylphenidate (D) and (D, L)
Antipsychotic (Neuroleptics, Major tranquillisers)	Drugs for psychosis		
Typical (1st generation)	dopamine	receptor antagonist (D2)	flupenthixol, fluphenazine, haloperidol, perphenazine, pimozide, pipotiazine, sulpiride, trifluoperazine, zuclopenthixol
	dopamine, serotonin	receptor antagonist (D2, 5-HT2)	chlorpromazine, thioridazine
Atypical (2nd generation)	dopamine	receptor antagonist (D2)	amisulpiride
	dopamine, serotonin	receptor antagonist (D2, 5-HT2)	iloperidone, loxapine, lurasidone, olanzapine, perospirone, sertindole, ziprasidone, zotepine
	dopamine, serotonin	receptor partial agonist (D2, 5-HT1A)	aripiprazole
	dopamine, serotonin, noradrenaline	receptor antagonist (D2, 5-HT2, NE alpha-2)	asenapine, clozapine, risperidone, paliperidone
		MM; receptor antagonist (D2, 5-HT2) and reuptake inhibitor (NET) (metabolite)	quetiapine

Table 1. (Continued)

Former terminology	**NbN – Pharmacological based**		Drugs
Indication based	Pharmacology	Mode of action[b]	
Anxiolytic	Drugs for anxiety		
(benzodiazepine)	GABA	Positive Allosteric Modulator (GABA-A receptor, benzodiazepine site)	alprazolam, chlordiazepoxide, clonazepam, clorazepate, diazepam, flunitrazepam, lorazepam, oxazepam
	serotonin	receptor partial agonist (5-HT1A)	buspirone
	glutamate	voltage-gated calcium channel blocker	gabapentin, pregabalin
	histamine	receptor antagonist (H1)	hydroxyzine
Hypnotic	Drugs for insomnia		
(benzodiazepine)	GABA	Positive Allosteric Modulator (GABA-A receptor, benzodiazepine site)	estazolam, eszopiclone, flunitrazepam, lormetazepam, midazolam, quazepam, temazepam, triazolam, zaleplon, zolpidem , zopiclone
	melatonin	receptor agonist (M1, M2)	melatonin, ramelteon
Mood stabilizers	Drugs for relapse prevention		
	glutamate	voltage-gated sodium and calcium channel blocker	carbamazepine, oxcarbazepine
	glutamate	voltage-gated sodium channel blocker	lamotrigine
	glutamate	yet to be determined	valproate
		enzyme interactions	lithium

[a]The glossary includes only the psychotropics relevant to former terminology. Newer psychotropics not included here could be found in NbN by their name.
[b]MM (Multi-Modal)=more than one mode of action.